ROOF RUNOFF DESIGN PROGRAM (RRDP)
Version 1.2 USERS GUIDE

Purpose and Description

The RRDP program calculates gutter and downspout capacity according to the criteria in the NRCS Agricultural Waste Management Field Handbook (AWMFH). Roof dimensions, rainfall depth, and gutter data are entered by the user, and the program calculates the gutter capacity, downspout capacity and the number of downspouts needed.

Software Requirements

Use of this program requires that Microsoft Excel® be installed. This workbook works with Microsoft Excel® 97 or later. The user should have a basic understanding of Excel®.

Installing the Program

Place the RRDP program in the appropriate directory. Open the program by double clicking on the file or through the Excel program.

Program Operation

The user can change the values in the spreadsheet which are unprotected. Unprotected cells show on the screen as being blue. Values entered by the user include the following: design return period, 5-minute rainfall depth for design return period, gutter depth, gutter freeboard, gutter top width, gutter bottom width, downspout dimension, roof length and roof width.

The user can quickly and easily try several different gutter and downspout sizes to determine best design. Design rainfall depths for 5 minute duration can be estimated using Figure 10B-3 and Figure 10B-4 of the AWMFH.

Disclaimer Statement

The USDA NRCS cannot assume liability for the use or maintenance of this spreadsheet or any results it may produce.

User Notes

It is recommended that users save files which they may want to use again with a different file name.

Example

See Exhibit 1 for a typical print out of the program.

Exhibit 1, Sample RRDP Output Page

EXHIBIT 1

USDA - Natural Resource Conservation Service

ROOF RUNOFF DESIGN PROGRAM - 5-minute RAINFALL DURATION

* Note: This worksheet is based upon the procedures described in chapter 10 of the Agricultural Waste Management Field Handbook.

Job: ARC BUILDINGS 1&2

Designed:	DH	Date:	03-24-94
Checked:	HA	Date:	03-24-94
Approved:	JB	Date:	03-24-94

Step 1: Compute Capacity of Selected Gutter Size

$q_g = 0.16407 * A_g * r^{0.67} * s^{0.5}$ (recommend s = 0.00521)

Select 10Yr or 25Yr Rainfall: 10

5-min. rain depth, P (in): 0.65 (SEE AWMFH, Figs. 10B-3 and 10B-4)

	ROOF 1	ROOF 2	ROOF 3	ROOF 4
GUTTER DATA				
Freeboard, FB (in)	0.5	0.5	0.5	0.5
Depth (in) incl. FB	6.00	6.00	6.00	5.00
Top Width (in)	7.0	6.0	5.0	4.0
Bottom Width (in)	3.0	3.0	3.0	3.0
Gutter Slope, s (ft/ft)	0.00521	0.00521	0.00521	0.00521
Wetted Perimeter, wp (in)	15.1	14.6	14.3	12.1
Hydaulic Radius, r (in)	1.76	1.64	1.51	1.28
Flow Area, A_g (sq in)	26.58	24.06	21.54	15.53
GUTTER CAPACITY, q_g (cfs)	0.46	0.40	0.34	0.22

Step 2: Compute Capacity of Downspout

$q_d = 0.010457 * A_d * H^{0.5}$ (arrow "*" indicates value used to determine the ai

	ROOF 1		ROOF 2		ROOF 3		ROOF 4	
Head = Depth, H (in)	5.50		5.50		5.50		4.50	
Dia. of Downspout (DS), (in)	3.0	*	0.0		5.0	*	0.0	
Length of DS Opening, (in)	0.00		3.00	*	3.00		1.00	*
Width of DS Opening, (in)	0.00		2.50	*	2.50		2.00	*
Area of DS, A_d (in^2)	7.07		7.50		19.64		2.00	
DOWNSPOUT CAPACITY, q_d	0.17		0.18		0.48		0.04	

Step 3: Determine if Gutter or Downspout Controls

$N_d = q_g / q_d$ (If N_d<1, gutter capacity controls)

	ROOF 1	ROOF 2	ROOF 3	ROOF 4
N_d = Number of Downspouts	2.7	2.2	0.7	4.9

Step 4: Determine Roof Area Gutter or Downspout can Serve

$A_r = q*3,600/P$

	ROOF 1	ROOF 2	ROOF 3	ROOF 4
Length of Building, (ft)	150	205	20	80
Width of Building, (ft)	50	50	50	30
Area of roof, (ft^2)	7500	10250	1000	2400
Controlling Capacity	DOWNSPOUT	DOWNSPOUT	GUTTER	DOWNSPOUT
Roof Area Served, A_r (sq ft)	960	1019	1859	246
Total Number of Downspouts	8	11	1	10